



Study of clinico-radiological profile of mediastinal masses in a tertiary care centre

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General Note



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ABSTRACT

Introduction: Mediastinal masses are relatively uncommon entities and continue to be an interesting diagnostic and therapeutic challenge to pulmonologists and thoracic surgeons and account for 3% of the tumours within the thorax. There has been a significant increase in the incidence of malignant mediastinal tumours over the past five decades. The presentation varies from asymptomatic lesions detected incidentally on radio imaging to severe life-threatening presentations. **Aim and Objectives:** To study the clinical, radiological and histomorphological profile of patients of mediastinal mass lesions at AVBRH. **Materials and Methods:** In this two-year prospective study, a total of 27 subjects who were suspected or diagnosed as mediastinal mass lesion, later confirmed by Computed Tomography (CT) imaging were included. The results were expressed as percentages or proportions. **Results:** Maximum numbers of patients (22.22%) were seen in the 7th decade and all patients (100%) were symptomatic at presentation. Malignant lesions (55.56%) were more common than benign (44.44%) and non-Hodgkin's lymphoma and thymic carcinoma was the commonest malignant tumour (11.11%). Mediastinal widening on chest X-ray was seen in 18 cases (66.66%), pleural effusion was seen in 14 cases (51.85%). On CT imaging and sub classification, anterior mediastinum was the commonest compartment involved (62.96%). **Conclusion:** The mediastinum is a complex anatomic area playing host to a wide variety of neoplastic and non-neoplastic lesions with different management plan to facilitate timely treatment. Adequate knowledge of the mediastinal compartments and precise localization and characterization of the lesions with the help of radiological modalities may help narrow the differential diagnosis.

Keywords: Mediastinal mass, Computed Tomography, Lymphoma, Thymic carcinoma

1. INTRODUCTION

The mediastinum is an intricate segment of the thorax that encompasses vital intrathoracic structures such as the heart and major vessels, esophagus, trachea and main bronchi, thymus, venous and lymphatic structures and nerve tissues (Carter et al., 2014) and is divided into anterior, middle and posterior compartments. Mediastinal mass lesions include a wide diversity of tumours which poses a diagnostic and therapeutic challenge to pulmonologists and thoracic surgeons and accounts for 3% of the tumours within the chest (Dasgupta et al., 2016). They may be congenital or acquired and may be primary or secondary. Anterior mediastinal tumours constitute 50% of the total mediastinal mass burden and include thymoma, lymphoma, germ cell tumours and thyroid disease. Masses of the middle mediastinum are typically congenital cysts while those originating in the posterior mediastinum are often neurogenic tumours (Baram and Tayeb, 2016). As the mediastinal space is narrow, any mass originating here will compress the surrounding structures and lead to symptoms or even life-threatening emergencies. The study aims to assess the recent trends in the incidence of various types of mediastinal masses, their clinical presentations, radiological characteristics, histomorphological spectrum and biological diversity of the mediastinal mass lesions.

2. MATERIALS AND METHODS

This was a prospective, cross sectional study conducted at Acharya Vinoba Bhave Rural Hospital, Wardha, India. A total of 27 patients having mediastinal mass lesions confirmed on radio imaging (CT scan/MRI thorax) were included in the study over a period of 2 years (1st August 2017 to 31st July 2019).

Inclusion criteria – All patients above the age 16 years suspected of having a mediastinal tumour either clinically or radiologically were included in the study.

Exclusion criteria – Patients of primary pulmonary or oesophageal malignancy and those not giving consent for the study were excluded from the study.

Methodology – a written informed consent was taken prior to the study. A detailed history, thorough clinical examination, Chest X ray, routine haematological and biochemical investigations and contrast enhanced CT scan/MRI thorax were performed in all patients. Invasive tissue diagnostic modalities like core needle biopsy or Fine needle Aspiration cytology and Immunohistochemical studies were done in relevant cases. Data was meticulously analyzed, tabulated and was expressed as percentages and proportions.

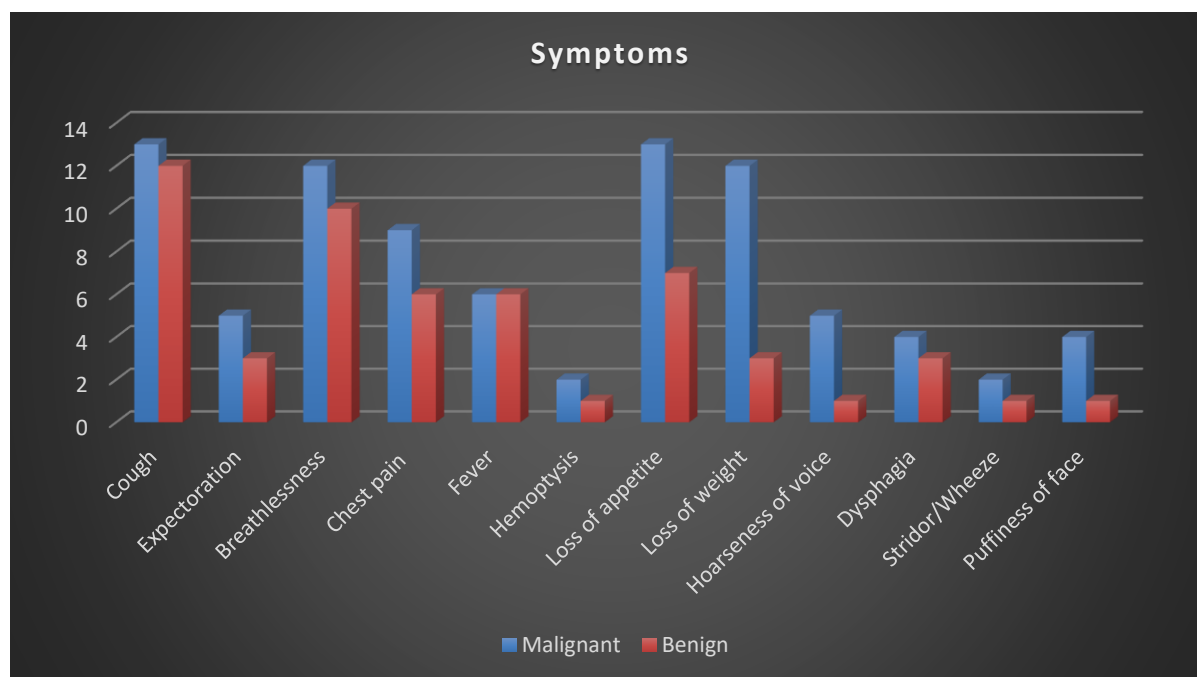
3. OBSERVATIONS & RESULTS

A total of 27 patients with mediastinal masses including 17 males (63%) and 10 females (37%) with a mean age of 47.18 ± 19.39 years (range, 16-75 years) (table 1) were enrolled in the study.

Table 1 Frequency of mediastinal tumours in different age groups

Age group (in years)	Malignant (%) [n=15]	Benign(%) [n=12]	Total(%) [n=27]
16-19	1 (6.66 %)	1 (8.33%)	2 (7.41%)
20-29	4 (26.67%)	1 (8.33%)	5 (18.52%)
30-39	2 (13.33%)	2 (16.67%)	4 (14.81%)
40-49	2 (13.33%)	2 (16.67%)	4 (14.81%)
50-59	1 (6.66%)	1 (8.33%)	2 (7.41%)
60-69	3 (20%)	3 (25.00%)	6 (22.22%)
70-79	2 (13.33%)	2 (16.67%)	4 (14.81%)

Hundred percent of the patients were symptomatic at the time of presentation and cough was the predominant symptom in 25 patients (92.59%) followed by dyspnea in 22 patients (81.48%), (Graph 1). Dysphagia was the most frequently noted symptom of mediastinal compression seen in 7 patients (25.92%) followed by hoarseness of voice in 6 patients (22.22%) seen more commonly in malignant lesions. Superior Vena Cava (SVC) syndrome was noted in 6 patients (22.22%), more commonly in those who had malignant tumours (non-Hodgkin's lymphoma) situated in the anterior mediastinal compartment.

**Graph 1** Frequency of symptoms in patients with mediastinal tumours

On general physical examination pallor was the most frequent finding in 12 patients (44.44%) followed by lymphadenopathy seen in 11 patients (40.74%). The most common group of lymph nodes involved was supraclavicular group. Other findings seen were swelling in neck, distension of abdomen and testicular swelling seen in 5, 3 and 1 patient respectively.

On examination of the respiratory system the predominant finding was decreased breath sounds on auscultation in 21 patients (77.78%) and parasternal dullness on percussion in 15 patients (55.55%) and it was normal in 4 patients (14.81%). Tracheal tug was found in 1 patient (3.70%) of aortic aneurysm. Blood investigations revealed anaemia (7 patients, 25.92%), leucocytosis (5 patients, 18.52%) and deranged thyroid functions (3 patients, 11.11%). Chest X ray PA view was the first radiological modality performed which revealed mediastinal widening as the most common finding seen in 18 patients (66.66%) followed by signs of pleural effusion noted in 14 patients (51.85%).

26 out of 27 patients underwent a contrast enhanced Computed Tomography (CT) scan of thorax, whereas 1 patient of posterior mediastinal mass underwent a Magnetic Resonance Imaging (MRI) in which a neurogenic tumour with an intraspinal extension was suspected. These radiological modalities were performed for compartmental localization and characterization of the masses. Compartmental localization was available in 24 patients (88.88%) (Table 2). Most of the lesions were in anterior mediastinum (17/27,

62.96%), followed by 5 (18.52%) in posterior, 2 (7.41%) in middle compartment. Three patients (11.11%) had masses involving multiple compartments of the mediastinum.

Table 2 Compartmental localization and characterization of the masses

Compartment of mass lesion	Malignant(%) [n=15]	Benign(%) [n=12]	Total(%) [n=27]
Anterior Mediastinum	9 (60%)	8 (66.66%)	17 (62.96%)
Middle Mediastinum	0 (0%)	2 (16.67%)	2 (7.41%)
Posterior Mediastinum	3 (20%)	2 (16.67%)	5 (18.52%)
Multiple compartments	3 (20%)	0 (0%)	3 (11.11%)

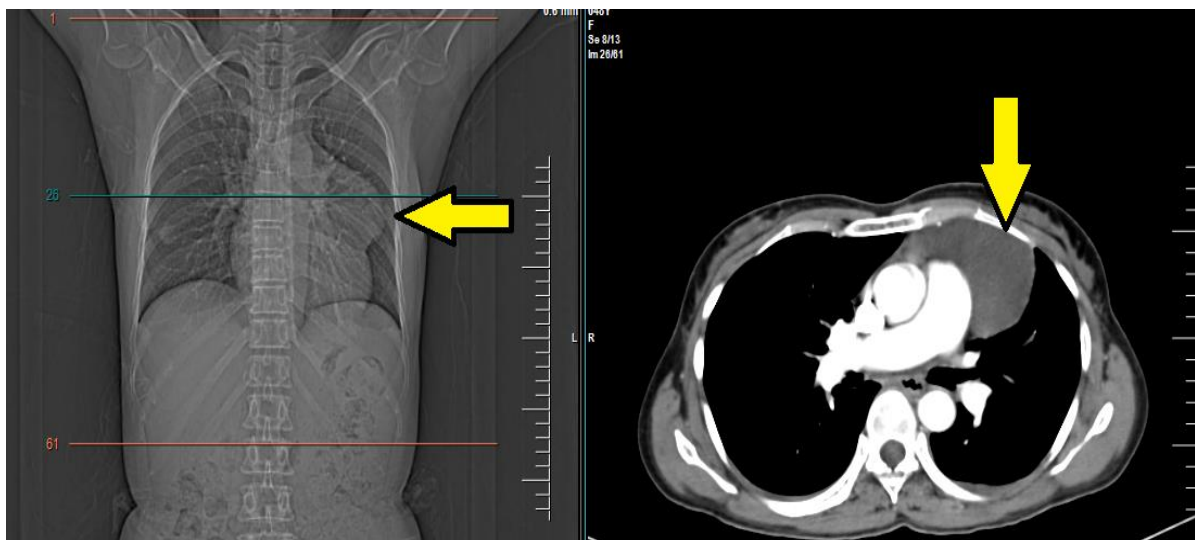


Figure 1 Arrow showing an anterior mediastinal mass lesion with cystic consistency later confirmed to be a simple thymic cyst

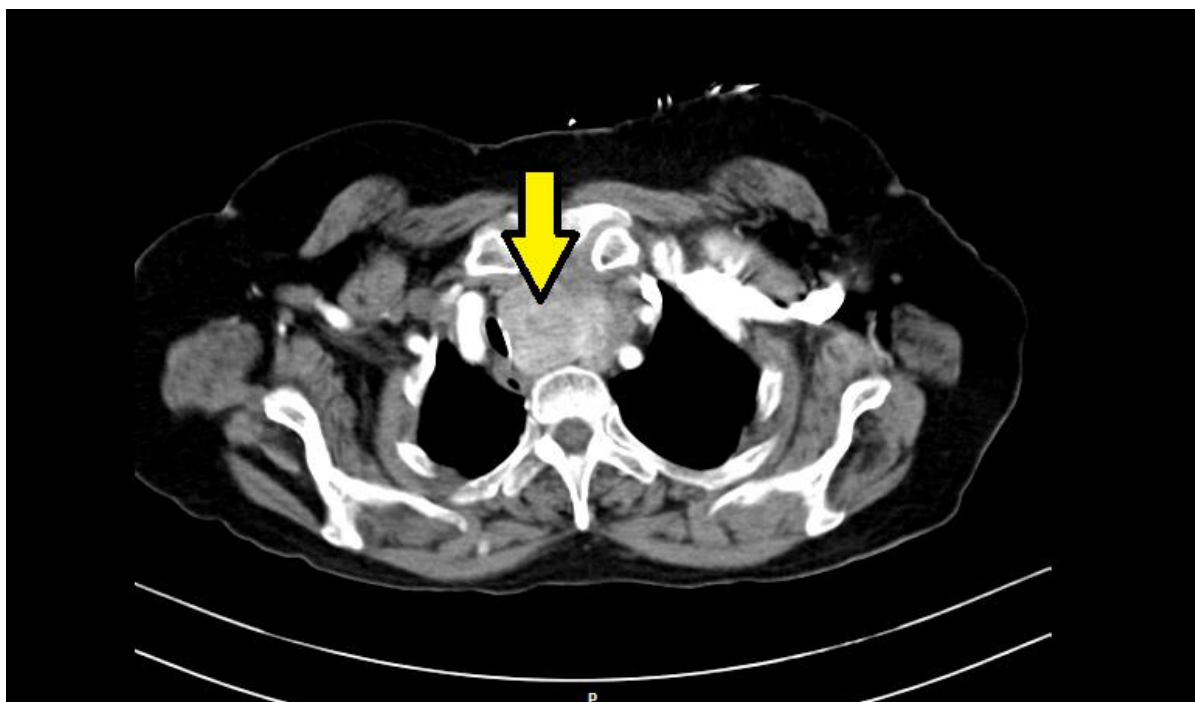


Figure 2 Arrow showing an antero-superior mediastinal mass later came out to be an adenomatous goitre

Most commonly occurring anterior compartment tumours included those of thymic origin, lymph nodal origin (lymphoma) and thyroid origin (figure 1). Common posterior mediastinal mass lesions included vascular lesions and neural tumours and middle mediastinal masses included cystic lesions.

Histopathological evaluation of these mediastinal tumours was done of which the most common ones in decreasing order of frequency were: Thymoma (11.11%) [1 each of AB type, A type and B1 type], thymic carcinoma (11.11%) (2 non-keratinizing squamous and 1 neuroendocrine thymic carcinoma), non-Hodgkin's lymphoma (11.11%) [1 each of diffuse large B cell type, peripheral T cell subtype, diffuse lymphoblastic type], germ cell tumours (11.11%) [1 patient each of seminoma, immature teratoma and embryonal carcinoma], Vascular lesions (11.11%) (2 patients descending aortic aneurysm and 1 patient of cavernous haemangioma). This was followed by thyroid lesions (7.41%) (1 retrosternal adenomatous goitre and 1 medullary carcinoma of thyroid), peripheral nerve sheath tumour (7.41%) (2 patients of malignant peripheral nerve sheath tumour), simple thymic cyst (7.41%), and 1 patient (3.70%) each of Hodgkin's disease, Acute T cell lymphoblastic leukaemia, Kikuchi Fujimoto disease, Mediastinal actinomycosis, malignant mesothelioma and pericardial cyst (figure 2 – 4 & graph 2).

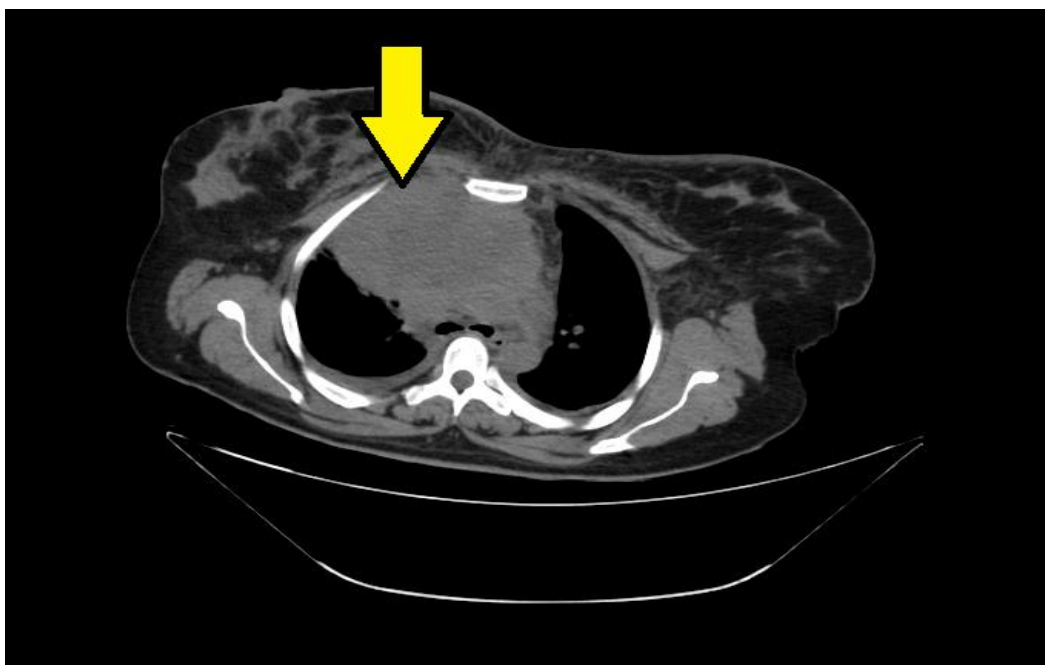


Figure 3 Arrow indicating an anterior mediastinal mass, histologically proved to be a thymoma

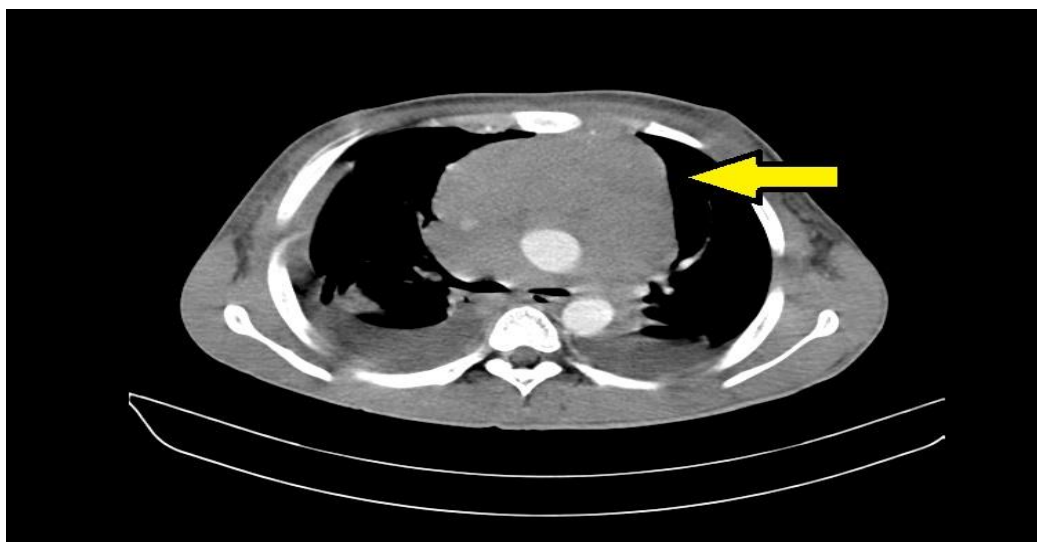


Figure 4 Arrow indicating a mediastinal mass lesion involving multiple compartments later came out to be a lymph nodal mass - Kikuchi Fujimoto disease




Graph 2 Histopathological types of mediastinal masses in the study

4. DISCUSSION

Primary mediastinal lesions represent a wide variety of disease states in view of multiplicity of the anatomical structures located in this area (Dixit et al., 2017). There is a paucity of data on the incidence of mediastinal mass lesions, possibly due to the wide diversity of these masses (Dasgupta et al., 2016). These tumours represent approximately three percent of tumours within the chest (Arora et al., 2014) and present a diagnostic and therapeutic challenge to clinicians, as well as radiologists. The mix of mediastinal lesions has been changing in the past five decades. Proportions of Lymphoma and Thymoma are on the rise while proportions of other lesions like congenital cysts or germ cell tumours have remained more or less constant. A comprehensive understanding of mediastinal anatomy is essential for the evaluation of these lesions, since specific lesions have a predilection for certain sites (Brown et al., 1990) (table 3).

Table 3: Overview of various studies on mediastinal masses

Characteristics 	Sample size (n)	Study period (years)	Mean age (years)	Age range	M:F ratio	Most common symptom	SVC syndrome (%)	Most common mediastinal compartment involved	Most common pathological diagnosis	Malignant Vs Benign lesions (%)
Current study	27	2	47.18 ± 19.39	16 to 75 years	1.7:1	Cough	22.22	Anterior mediastinum	Thymic Neoplasm	55.56% vs 44.44%
Aroor et al (5)	35	2	45.4	17 to 68 years	2.2:1	Cough	20	Anterior mediastinum	Lymphoma	68.57% vs 31.43%
Bagheri et al (7)	95	20	35.4 ± 16.52	-	1.2:1	Dyspnea	-	Anterior mediastinum	Lymphoma	
Aggarwal et al (8)	116	2	41.14 ± 18.98	3 months to 75 years	1.7:1	-	-	Anterior mediastinum	Thymic Neoplasm	27.6% vs 72.4%
Dasgupta et al (2)	22	3	18.3	6 months to 56 years	2:1	Dyspnea and chest pain	18	Anterior mediastinum	Thymic Neoplasm	-
Bhattarai et al (9)	112	5	34.94	4 months to 82 years	1.2:1	-	-	Anterior mediastinum	Thymic Neoplasm	33.9% vs 62.5%*
Patidar et al (10)	50	1	-	-	2:1	Cough	-	Anterior mediastinum	Thymic Neoplasm	44% vs 56%
Dixit et al (4)	139	8	45.5	14 to 76 years	5:1	Cough	28.7	Anterior mediastinum	Metastatic carcinoma	66.9% vs 23%#
Dubashi et al (11)	91	13	37.48 ± 17.04	1 to 76 years	2.8:1	Cough	28.5	Anterior mediastinum	Thymic Neoplasm	-
Shrivastava et al (12)	106	10	34 ± 20.4	6 months to 62 years	1.9:1	Chest pain	-	Anterior mediastinum	Thymic Neoplasm	39% vs 61%
Takeda et al (13)	806	50	35.5	1 day to 84 years	1.3:1	Chest pain	6.5	Anterior mediastinum	Thymic Neoplasm	45% vs 55%
Davis et al (14)	400	56	-	7 day to 83 years	1.1:1	Chest pain	6	Anterior mediastinum	Thymic Neoplasm	42% vs 58%
Vaziri et al (15)	105	5	34	2 to 80 years	1.6:1	Dyspnea	10	Anterior mediastinum	Lymphoma	60% vs 40%

*3.6% were inconclusive results, #10.1% were inconclusive results

In our study we evaluated 27 patients in whom a mediastinal mass lesion was suspected either clinically or radiologically which later was confirmed by radio imaging and their clinical, radiological and pathological characteristics were analyzed. The mean age of presentation in our study group was 47.18 ± 19.39 years with a range of 16 years to 75 years. This finding was consistent with findings of (Aroor et al., 2014) and (Dixit et al., 2017). In our study, we found that the most common age groups involved were 60 to 69 years and 20 to 29 years. This finding was similar to that in the study by (Patidar et al., 2016) was inconsistent with studies done by (Aggarwal et al., 2016), (Dixit et al., 2017), (Aroor et al., 2014), (Vaziri et al., 2009) and (Bhattarai, 2016) in which the most common age was 2nd and 3rd decade of life.

In the present study the majority of subjects were male (63%) with a male to female ratio of 1.7:1. This was similar to studies by (Aroor et al., 2014) [M:F= 2.2:1], (Dasgupta et al., 2016) [M:F= 2.1:1], (Takeda et al., 2003) [M:F= 1.33:1], (Dubashi et al., 2009) [M:F= 2.8:1], (Aggarwal et al., 2016) [M:F= 1.7:1], which demonstrates a male predilection for mediastinal masses. All the patients were symptomatic at the time of presentation which is in contrast to other studies which had higher incidences of asymptomatic patients shown in studies done by (Vaziri et al., 2009) (12%), (Adegboye et al., 2003) (22.9%) and Davis et al., 1987) (38%). In our study the predominant respiratory symptom was cough (in 92.59%) followed by breathlessness (in 81.48%). This result was in agreement with other studies by (Aroor et al., 2014) (57.14%), (Dixit et al., 2017) (91.3%) and (Dubashi et al., 2009) (83.5%). In the present study, the most common symptom due to compression of the mediastinal contents was dysphagia (25.92%) followed by hoarseness of voice (22.22%). These compressive symptoms were noted more commonly in patients with malignant mass lesions which may be due to larger sizes and local invasiveness of these masses.

In the present study, signs of Superior Vena Cava obstruction were seen in 6 (22.22%) patients which was higher as compared to that in studies by (Vaziri et al., 2009) (10%), (Takeda et al., 2003) (6.5%), (Aroor et al., 2014) (20%), and (Dasgupta et al., 2016) (18%) while it was lower as compared to that in studies by and (Dixit et al., 2017) (28.7%) and (Dubashi et al., 2009) (28.5%).

The most common respiratory system finding in our study was decreased breath sounds on auscultation (77.78%) followed by parasternal dullness (55.55%) on percussion. This finding was in concordance to findings of (Aroor et al., 2014) where the predominant respiratory examination finding was parasternal dullness (61.54%). Chest X-ray was the first radiological investigation

performed in our study which showed a variety of roentgenological signs out of which the most common was mediastinal widening found in almost 2/3rd (66.66%) of the patients which was in agreement with the findings of (Aroor et al., 2014) (77.14%). Contrast enhanced Computed Tomography (CECT) scan of thorax was performed in 26 (96.30%) patients and 1 (3.70%) patient underwent Magnetic Resonance Imaging (MRI) of thorax in whom chest X ray findings were suggestive of mediastinal pathology. The CT scan helped in identifying the precise location, extent, and characterization of these masses whereas MRI can be used for tissue characterization and assessment of surgical resectability. The most common compartment involved in the present study was the anterior mediastinum (62.96%) which had 9 malignant and 8 benign lesions, which was in concordance with the findings of (Bagheri et al., 2015) (68.42%), (Dixit et al., 2017) (68.3%), (Vaziri et al., 2009) (65%), (Takeda et al., 2003) (62.6%), (Patidar et al., 2016) (50%), (Aroor et al., 2014) (42.86%), (Dasgupta et al., 2016) (42.86%), (Dubashi et al., 2009) (93.6%), (Aggarwal et al., 2016) (70.1%), (Bhattarai, 2016) (88.4%), (Shrivastava et al., 2006) (63.8%). Usually, the most common lesions found in the anterior mediastinum are of thymic or lymph nodal origin. Even the germ cell tumours arise from the pluripotent cells of the thymus.

In our study, the most commonly encountered lesion in the anterior mediastinal compartment was that of thymic origin (29.63%) followed by patients with lymphoma/leukaemia, germ cell tumours and thyroid lesions. This observation was similar to that in other studies by (Aroor et al., 2014), (Patidar et al., 2016), (Dubashi et al., 2009) and was contrary to the observation in studies by (Shrivastava et al., 2006), (Bagheri et al., 2015), (Vaziri et al., 2009) where lymphoma was the commonest lesion. The next most common compartment involved in the present study was posterior mediastinum (18.52%) with vascular lesions as the most common lesion followed by 1 patient each of nerve sheath tumour, lymphoma and germ cell tumour. Some lesions involved multiple compartments of the mediastinum (11.11%) that included 2 patients of lymphoma and 1 patient of nerve sheath tumour. This may have occurred as there are no physical boundaries between compartments that limit the disease. Out of the 27 patients included in the study, 23 underwent invasive tissue diagnostic modality in the form of Fine Needle Aspiration Cytology (FNAC) or Trucut/core biopsy under USG or CT guidance. Four patients did not undergo any invasive tests which included 3 patients with vascular lesions and 1 patient with pericardial cyst. The most common pathologically proven diagnosis was thymic neoplasm (29.63%) followed by lymphoma (18.52%). This result was comparable to those studies by (Dasgupta et al., 2016), (Dubashi et al., 2009), (Aggarwal et al., 2016), (Patidar et al., 2016), (Shrivastava et al., 2006) and (Bhattarai, 2016) where thymic lesions were the most common ones whereas in studies by (Aroor et al., 2014), (Vaziri et al., 2009), (Baram and Tayeb, 2016) and (Bagheri et al., 2015) where lymphoma was the commonest pathology.

The tumours in the order of frequency of occurrence were thymic neoplasms, lymphoma, germ cell tumours, vascular lesions, neural tumours and thyroid neoplasms. Thymic neoplasms consisted of 3 patients each of thymoma and thymic carcinoma and 2 patients of thymic cyst. There were 3 patients of non-Hodgkin's lymphoma and 1 patient each of Hodgkin's lymphoma and Acute T cell lymphoblastic leukaemia. Germ cell tumours comprised of 1 patient each of seminoma, embryonal carcinoma and immature teratoma. Vascular lesions consisted of 2 patients of aortic aneurysm and 1 patient of cavernous haemangioma. Other diagnoses included 2 patients' peripheral nerve sheath tumours, 1 patient each of retrosternal adenomatous goitre, medullary carcinoma of thyroid, mediastinal actinomycosis, Kikuchi Fujimoto disease, malignant mesothelioma and pericardial cyst.

The present study highlights the importance of an integrated clinical, radiological, and histological approach in the evaluation and diagnosis of mediastinal tumours. The clinical approach comprises of in-depth history of symptoms, demographic features, and detailed examination for physical signs. The currently available modalities for further assessment include chest roentgenograms, ultrasound, CT scan, magnetic resonance imaging (MRI), and nuclear medicine studies (PET/PET CT scan). Chest X-ray provides information on the size, anatomical location, density, and at times composition of the mass. Contrast-Enhanced CT scan of thorax is an essential tool that provides additional information, i.e., relationship of the mass with adjacent structures, vascularity within the mass, content, and nature (cystic or solid) of the mass. MRI provides useful information in evaluating spinal, vascular, or cardiac invasion. Although clinical evaluation along with radiographic imaging often narrows the differential diagnosis, definitive tissue diagnosis is often required before initiating therapy. There are several modalities to obtain tissue samples for cytological or histological diagnosis of mediastinal lesions which includes percutaneous image-guided transthoracic needle biopsy or Fine Needle Aspiration Cytology (under ultrasound or CT guidance); Transbronchial biopsy through a fiberoptic bronchoscope; endoscopic biopsy with ultrasonography, i.e., bronchoscopically (EBUS) or through the oesophagus (endoscopic ultrasound [EUS]) using a fine needle. Various surgical procedures to get tissue diagnosis are cervical mediastinoscopy, mediastinotomy, thoracoscopy, i.e., video-assisted thoracoscopic surgery, sternotomy or thoracotomy, etc. The choice of these modalities in diagnostic assessment of mediastinal lesions depends on the local availability and expertise. Endoscopic biopsies are generally preferred nowadays in view of lesser complications and ease compared to surgical interventions (Dixit et al., 2017).

5. CONCLUSION

We conclude with a remark that mediastinum is a complex anatomic area playing host to a wide variety of neoplastic and non-neoplastic lesions with different management plan to facilitate timely treatment. Adequate knowledge of the mediastinal compartments and precise localization and characterization of the lesions with the help of radiological modalities like CT scan/MRI thorax may help narrow the differential diagnosis. FNAC and/or core needle biopsy are minimally invasive, safe, easy to perform techniques that allow adequate tissue sampling with high diagnostic accuracy and least risk to the patients. These tissue diagnostic modalities are not only precise but are also less expensive, easily available and eliminate the need for more extensive diagnostic surgical procedures and hospital stay. The tumour types have a close association with the long-term survival of the patients. Newer diagnostic modalities like transsternal approach, transbronchial approach (EBUS) and transoesophageal approach (EUS) may result in earlier diagnosis and treatment.

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Conflicts of Interest: The authors declare no conflict of interest.

Author's contribution

Aishwarya, Dubey – primary author, acquisition and interpretation of data and discussion writing

Babaji, Ghewade – drafting the aims and objectives and design of the study and making critical revisions

Keerthan, Ganapathi – data collection and interpretation

Diti, Gandhasiri - data collection and interpretation

Dadasaheb, Sherekar - data collection and interpretation

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